



INSECTS OF SAMOA AND OTHER SAMOAN TERRESTRIAL ARTHROPODA

List of Fascicles issued to 23rd June, 1928 :—

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Date Issued.

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INSECTS OF SAMOA

AND OTHER SAMOAN TERRESTRIAL
ARTHROPODA

PART VII. OTHER ORDERS OF INSECTS

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MALLOPHAGA. By J. WATERSTON, D.Sc.

ANOPLURA. By P. A. BUXTON, M.A.

TRICHOPTERA. By MARTIN E. MOSELY.

NEUROPTERA. By P. ESBEN-PETERSEN.

APTERYGOTA. By GEORGE H. CARPENTER, D.Sc.

WITH TWO PLATES AND THIRTY-FIVE TEXT-FIGURES



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INSECTS OF SAMOA AND OTHER SAMOAN TERRESTRIAL ARTHROPODA

Although a monograph, or series of papers, dealing comprehensively with the land arthropod fauna of any group of islands in the South Pacific may be expected to yield valuable results, in connection with distribution, modification due to isolation, and other problems, no such work is at present in existence. In order in some measure to remedy this deficiency, and in view of benefits directly accruing to the National Collections, the Trustees of the British Museum have undertaken the publication of an account of the Insects and other Terrestrial Arthropoda collected in the Samoan Islands, in 1924-1925, by Messrs. P. A. Buxton and G. H. E. Hopkins, during the Expedition of the London School of Hygiene and Tropical Medicine to the South Pacific. Advantage has been taken of the opportunity thus afforded, to make the studies as complete as possible by including in them all Samoan material of the groups concerned in both the British Museum (Natural History) and (by courtesy of the authorities of that institution) the Bishop Museum, Honolulu.

It is not intended that contributors to the text shall be confined to the Museum Staff or to any one nation, but, so far as possible, the assistance of the leading authorities on all groups to be dealt with has been obtained.

The work will be divided into eight "Parts" (see p. 3 of wrapper), which will be subdivided into "Fascicles." Each of the latter, which will appear as ready in any order, will consist of one or more contributions. On the completion of the work it is intended to issue a general survey, summarising the whole and drawing from it such conclusions as may be warranted.

A list of Fascicles already issued will be found on the back of this wrapper.

E. E. AUSTEN,
Keeper of Entomology.

BRITISH MUSEUM (NATURAL HISTORY),
CROMWELL ROAD, S.W.7.

INSECTS OF SAMOA

PART VII. FASC. 3

MALLOPHAGA.

BY J. WATERSTON, D.Sc.

(With 2 Text-figures.)

ALTHOUGH comparatively few Mallophaga collected from Samoan birds have been submitted to me by Mr. Buxton for determination,* the peculiar constancy of the relation between these parasites and their hosts renders feasible the drawing up of a longer list than the material actually examined might warrant. The chief difficulties in compiling such a list have lain in tracing host-references through the scattered literature of the subject, and in assessing the value of existing records. It is hoped, however, that the following notes, referring to the Mallophaga of about one-third of the birds on the Samoan list, may prove suggestive to some future worker with ampler facilities for study.

It has seemed best to arrange the species of parasites according to their hosts. In doing this I have omitted records which are evidently casual, since confusion of this sort generally results from contact between hosts in the game bag. It is a well-known fact that "straggling" occurs at the present day quite normally among bird parasites in the Galapagos Is. There is no evidence, however, that the unusual conditions of bird life found in the latter group of islands hold in Samoa, and accordingly, even when a host's range covers both areas, only the normal parasites are mentioned below.

The references to the species are restricted to author and year. For fuller details Harrison's "Genera and Species of the Mallophaga" (*Parasitology*, IX, No. 1, October, 1916) should be consulted.

* The names of these species are printed in heavy type and numbered.

HOST.

TYTO ALBA LULU.

Colpocephalum subpachygaster Piaget (1880).

Philopterus rostratus Nitzsch (1838).

"*Nirmus*" *angulatus* Piaget (1880), recorded from this host is apparently a straggler from some (?) passerine bird.

"FROM LEGS OF OWL" presumably *T. alba*.

1. *Colpocephalum subpachygaster* Piag.

♀.

Samoa : Matautu, v.1921 (O'Connor).

VINI AUSTRALIS.

2. *Eomenopon denticulatum* Harrison (1915).

Samoa : Apia, Vailele, ii.1924.

EUDYNAMIS TAITENSIS.

On cuckoos three genera of Mallophaga occur, *Philopterus*, *Degeeriella* and *Cuculiphilus*.

Cuculiphilus semilunaris Piaget (1880) (doubtfully distinct from *C. fasciatus*.

Scopoli (1763)) will occur on the Samoan bird. The *Degeeriella* should be a sub-sp. of *D. dilatatofasciatus* Piaget (1880); while the *Philopterus* should be compared with *P. latifrons* Denny (1842).

HALCYON PEALEI.

Philopterus alatoclypeatus Piaget (1855) (or sub-sp.).

ZOSTEROPS, SP.

On the genus *Zosterops* a *Philopterus* of the "communis" type occurs; *Myrsidea* has also been recorded. Besides these *Menacanthus*, sp. and *Degeeriella*, sp. are to be expected.

APLONIS ATRIFUSCA.

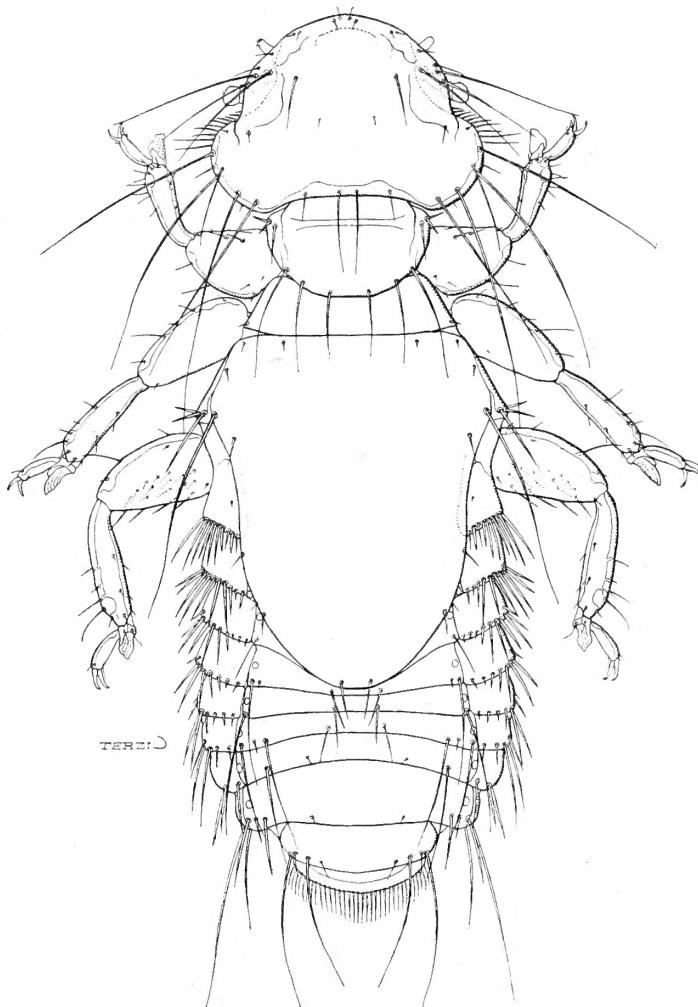
Uchida (1926) records *Myrsidea terakai* Uchida (1918) from *Aplonis kittizi* (Caroline Is.; Truk I.), but the Samoan examples differ in important details from the original figures and descriptions.

3. *Myrsidea buxtoni*, sp. n. (Text-figs. 1 and 2).

♀. Dimensions—

		Length.	Breadth.
Head		0·36 mm.	0·51 mm.
Prothorax		0·19 mm.	0·33 mm.
Mesothorax		0·09 mm.	0·39 mm.
Metathorax		0·70 mm.	0·58 mm.
Abdomen		0·84 mm.	0·60 mm.
Total		1·65 mm.	

Similar to *Myrsidea teraokai* Uchida (*Annot. Zool. Japonenses*, vol. ix, pt. iv, p. 490, fig. 2, 1918), but larger and even more specialised in the tergites and

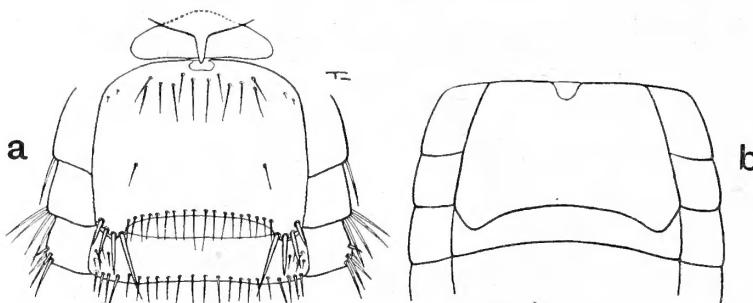


TEXT-FIG. 1.—*Myrsidea buxtoni*, sp. n. ♀.

metathorax. The greatly produced posterior edge of the latter, helmet shaped not rounded triangular as in *M. teraokai*, completely covers tergites 1 and 2 posteromedianly, and its own posterior edge coalesces with that of tergite 3.

In *M. teraokai* tergites 1-3 are only a little less modified than the metathorax, and their hind margins remain subparallel and distinct.

M. buxtoni lacks the long lateral bristles of *M. teraokai*, but tergites 4-7 inclusive have each a long bristle remote from the edge. There are numerous shorter pleural spinose bristles.



TEXT-FIG. 2.—Abdominal sternites (ventral view) of (a) *Myrsidea buxtoni*, sp. n.; (b) *M. teraokai* Uchida.

The second sternite has on each side a postero-lateral lobe bearing an aster of 4 spines, of which the innermost is longest and extends well across the posterior margin of sternite 3.

Samoa : Apia, 4.ii.1924, type ♀ (in British Museum), from *Aplonis atrifusca*.

CARPOPHAGA PACIFICA.

Menopon quinqueguttatum Rudow (1869).

Colpocephalum unicolor Rudow (1866).

PORPHYRIO POLIOCEPHALUS.

Menopon gracile Piaget (1880).

Rallicola lugens Giebel (1874).

Philopterus continuus Piaget (1880).

LIMOSA NOVAE-HOLLANDIAE.

Menopon meyeri Giebel (1874).

? *Degeeriella lucida* Kellogg and Mann (1912).

Degeeriella cingulata Nitzsch in Denny (1842).

Philopterus limosae Denny (1842).

TOTANUS INCANUS.

Menopon lutescens Nitzsch in Burmeister (1838).

Colpocephalum kilauense Kellogg and Chapman (1902).

Degeeriella, sp.

Philopterus cordiceps Piaget (1880).

CHARADRIUS DOMINICUS.

Menopon lutescens Nitzsch in Burmeister (1838).

4. *Actornithophilus timidus* Kellogg (1896).

Upolu : Apia, vi.1925.

5. *Degeeriella oraria* Kellogg (1896).

Upolu : Apia, vi.1925.

Philopterus conicus Denny (1842).

(Syn. *Philopterus wallacei* Johnston and Harrison (1912); *Docophorus hawaiiensis* Kellogg and Chapman (1902).)

STREPSILAS INTERPRES.

Menopon lutescens Nitzsch in Burmeister (1838).

Colpocephalum pediculoides Mjöberg (1910).

Actornithophilus bicolor Piaget (1880).

Degeeriella euprepes Kellogg and Chapman (1902).

Degeeriella actophilus Kellogg and Chapman (1899).

Degeeriella zonaria Nitzsch (1866).

Philopterus variabilis Denny (1842).

Philopterus cordiceps Piaget (1880).

NUMENIUS FEMORALIS.

Menopon crocatum Nitzsch in Giebel (1866).

Colpocephalum patellatum Piaget (1888).

Degeeriella phaeopi Denny (1842).

Dollabella testudinaria Denny (1842).

Philopterus humeralis, sub-sp. *numeniicola* Johnston and Harrison (1912).

DEMIEGRETTA SACRA.

Colpocephalum decimfasciatum Boisduval and Lacordaire (1835).

Colpocephalum nyctarde Denny (1842)

Myrsidea teraokai Uchida (1918) is a straggler in this host.

FREGATA AQUILA.

- Menopon aurifasciatum* Kellogg (1899).
Colpocephalum spineum Kellogg (1899).
Esthiopterum majus Kellogg (1899).
Esthiopterum gracilicorne Piaget (1880).

SULA SULA.

- Menopon*, sp.
Pectinopygus sulae Rudow (1870).

" GANNET " presumably *S. sula*.

6. *Menopon*, sp.

Samoa : Nuulua I., xi.1924, ♀.

7. *Pectinopygus sulae* Rud.

Samoa : Nuulua I., xi.1924, ♀.

SULA PISCATOR.

- Menopon*, sp.
Pectinopygus potens Kellogg and Kuwana (1902).
Esthiopterum annulatum Piaget (1880).

PHAETHON AETHEREUS.

- Menopon singulare* Kellogg and Kuwana (1902).
Menopon becki Kellogg (1907).
Philopterus uppensis Rudow (1870), ? straggler.

STERNA BERGII.

- Menopon fuscofasciatum* Piaget (1880).
Actornithophilus crassipes Piaget (1880).
Actornithophilus piceus Denny (1842).
Philopterus melanocephalus Nitzsch in Burmeister (1838).

STERNA FULIGINOSA.

- Menopon fuscofasciatum* Piaget (1880).
Actornithophilus piceus Denny (1842).
Degeeriella birostris Giebel (1874).
Degeeriella obtusa Kellogg and Kuwana (1902).
Philopterus melanocephalus Nitzsch in Burmeister (1838).

HALOBAENA COERULEA.

Esthiopterum clypearium Giebel (1874).

GALLUS DOMESTICUS.

8. *Menopon gallinae* Linné (1758).

Neumannia pallidula Neumann (1912).

Eomenacanthus stramineus Nitzsch. in Giebel (1874).

(Syn. *Menopon biseriatum* Piaget (1880).)

Goniocotes hologaster Nitzsch in Burmeister (1838).

Goniocotes gigas Taschenberg (1879).

9. *Goniodes dissimilis* Nitzsch in Denny (1842).10. *Lipeurus caponis* Linné (1758).

Lipeurus burnetti Packard (1870).

The above are the species regularly found on domestic fowls. Those numbered 8 to 10 have already been reported as having been met with in Apia, in 1925 (Buxton and Hopkins, *Researches in Polynesia and Melanesia*, 1927).

LIST OF TEXT-FIGURES.

Text-fig. 1. *Myrsidea buxtoni*, sp. n. ♀.

„ 2. Abdominal sternites (ventral view) of (a) *Myrsidea buxtoni*, sp. n.; (b) *M. teraokai* Uchida.

A N O P L U R A

By P. A. BUXTON, M.A., London School of Hygiene and Tropical Medicine.

THE only mammals native to Samoa are three species of Bat (*Pteropus samoënsis*, *P. tonganus*, and *Emballonura semicaudata*), and the Native Rat (*Rattus exulans*). On the bats no lice would be expected, and none were obtained ; the Native Rat is more interesting. Several small species of *Rattus* have been recorded or described as occurring in Melanesia, Fiji, Tahiti, New Zealand, Hawaiiia, and other parts of Oceania ; the relation between them is at present obscure, but it is probably true to say that only one species exists, and that the correct name is *Rattus exulans* Peale ; this species is closely related to *Rattus concolor* of Malaya. In old days the rats were carried from place to place in canoes ; they are now rarer than formerly, because their place has been taken by forms of *Rattus rattus*, recently introduced with shipping (Miller, Stone). We failed to find lice on the seven specimens of *Rattus exulans* which we examined in Samoa, but Ewing has described a species of *Hoplopleura* (*H. pacifica*), which occurs on this small rat, and of which he examined specimens from Rose* Island, Samoa and many parts of Malaya and Polynesia.

Among the introduced mammals, the dog and the pig were brought to Samoa many centuries ago by immigrant Polynesians. We know from the early voyagers that the dogs and pigs were of distinctive races, which have long since ceased to exist, for the animals interbred with those of a European type, introduced during the last century and a half. But though the native race of pig has disappeared, it has left what appears to be a relic, a variety of pig-louse betraying its connection with the wild swine of south-east Asia. It may therefore be said that though very few species of Anoplura are known to occur in Samoa, two of them indicate the former connection of the Samoans with Malaya and south-east Asia.

Little is known of the lice that may be presumed to parasitise the animals introduced by Europeans during the last hundred and fifty years ; the common

* Wrongly spelt "Rosa Island" in Ewing's paper.

parasites of horses, donkeys, sheep, goats, cows, probably occur, but they have not been collected.

The species of which specimens have actually been collected are as follows.

1. *Pediculus humanus* Linn.

The Head Louse (*Pediculus humanus capitis*) is abundant in Samoa; I have no actual records of the occurrence of *P. h. corporis*.

2. *Phthirus pubis* Leach.

A number of cases of infestation of the eye-lashes by this insect were discovered in a boys' school near Apia.

3. *Haematopinus suis* var. *adventicius*. Neum.

A number of specimens of this louse were collected at Apia, in 1925, from pigs which had been imported from New Zealand, but had been kept among others bred in Samoa. Examples of the same variety of louse were sent to me from Hog Harbour, Santo Island, New Hebrides. These were identified by Dr. J. Waterston, who informs me that Neumann's variety was described from specimens from wild swine (*Sus vittatus*) in south-east Asia. This is extremely interesting, because it appears to provide fresh and unusual evidence of the connection between the primitive Polynesians and the nearest part of Asia.

4. *Polyplax spinulosa* Burm.

Apia, 1924, 1925, on *Rattus rattus*, which has certainly been brought to Polynesia by European shipping within the last century.

5. *Hoplopleura pacifica* Ewing.

We did not collect this insect on the seven specimens of *Rattus exulans* which we examined. Ewing described it from material from the small Native Rat of the Hawaiian Islands; he also saw examples from Rose Island, Samoa and elsewhere.

REFERENCES.

- EWING, H. E. "Ectoparasites of some Polynesian and Malaysian rats of the genus *Rattus*," *Bernice P. Bishop Museum, Bull.* 14, pp. 7-11, 1924.
MILLER, G. S. "The characters and probable history of the Hawaiian rat," *Ibid.*, pp. 3-6, 1924.
STONE, W. "The Hawaiian Rat," *Occasional papers of Bernice P. Bishop Museum*, Vol. 3, pp. 253-260, 1917.

TRICHOPTERA

BY MARTIN E. MOSELY

(With Plate II, figure 7.)

VERY little is known of the Trichoptera of Samoa, and evidently this Order received scant attention from the collectors.* Among the insects brought home the only representative is a single Hydroptilid, unfortunately of the female sex. In this family the characters for the separation of the species are found mostly in the males, the females resembling one another closely, and generally presenting no comprehensible variation in structure.

The recording of new species, and perhaps even new genera, from single female examples is to be deprecated, and I shall therefore leave it to the future, when perhaps more material may be available, to give a name to the genus and species of the Samoan Hydroptilid. The genera of Hydroptilidae are founded on characters such as the presence or absence of ocelli, the numbers and arrangements of the spurs on the legs, the shape of the wings, and their neuration.

In the Samoan example we find : length of anterior wing 4 mm. ; ocelli present ; spurs 0, 3, 4 ; wings densely clothed with fulvous hairs, with various whitish markings, and dense dark fringes ; anterior wing broad at the base, becoming suddenly acute towards the apex, and tapering to a long fine point ; posterior wing with a decided costal elevation, followed by an excision, and tapering to a long fine point ; neuration incomplete (plate II, fig. 7).

Upolu : Apia, 29.iii.1924.

In most genera of the Hydroptilidae the neuration is indistinct and difficult to make out, the difficulty varying somewhat in different examples. In this

* My own feeling is that Trichoptera must be extremely rare in Samoa, both as species and as individuals. It will be remembered that no fewer than 137 species of Microlepidoptera were collected, and that in the field the Hydroptilidae are most easily confused with these insects.—P. A. BUXTON.

single example the neuration is so obscure that to attempt a description would entail drawing to a certain extent on the imagination. I therefore content myself with giving a photograph, showing chiefly the rather striking shape of the anterior wing. I know of no other Hydroptilid in which the wings are shaped quite as in this form, and it is evident that the insect falls under Division B in MacLachlan's table, and that it is related to *Oxyethira*.

ILLUSTRATION.

Plate II, fig. 7. Wing of female Hydroptilid, Apia.

NEUROPTERA

By P. ESBEN-PETERSEN, Silkeborg, Denmark.

(With 1 Text-figure and Plates II and III.)

OUR present knowledge of the Neuroptera of the Samoan and adjacent islands is very limited. In his "List of the Specimens of Neuropterous Insects in the Collection of the British Museum," Part III (1853), Walker has given a description of *Chrysopa remota*, of Samoa, and in *Verhandl. zool.-bot. Ges., Wien*, Bd. xvii, pp. 507-508, Taf. xiv (1867) Brauer describes *Hemerobius graeffei* (Upolu), and *Micromus navigatorum* (Fiji, Ovalau and Upolu); the types of both species are in the Museum Godeffroy (Zoological Museum, Hamburg). No other species are known as occurring in the Samoan Islands; but *Chrysopa filosus* Fabricius (not met with since the time of its discovery), *C. sanvitoresi* Navas, *Notiobiella pretiosa* Banks, and *Eidoleon bistrigatus* Rambur were described from specimens from the Society and Fiji Is.

In the present pages twelve species are added to the Samoan fauna, one species to the fauna of the Society Is. and one to that of Tonga.

The Neuropterous fauna of the islands is of a fragmentary character. The three families, ASCALAPHIDAE, OSMYLIDAE and MANTISPIDAE, found in almost all parts of the world, are not represented in Samoa nor elsewhere in Polynesia. The peculiar families NYMPHIDAE, PSYCHOPSIDAE, ITHONIDAE and MYIODACTYLIDAE, for which the Australian continent may be regarded as a centre of distribution, are also completely wanting.

Only three families, MYRMELEONIDAE, HEMEROBIIDAE, and CHRYSOPIDAE, are represented in the Samoan fauna; and, so far as it is known, the same is generally true of the fauna of the whole of Polynesia.

The MYRMELEONIDAE have one representative which seems to be characteristic for Samoa and the adjacent islands. In the case of the large family HEMEROBIIDAE we encounter a richer and more interesting fauna, and, in addition to the widely distributed genus *Archaeomicromus*, we have the peculiar genera *Eucarobius* and *Buxtonia*, which, so far as our knowledge goes, appear to be

confined to the Samoan Islands. The two last genera are, however, nearly related to the Australian genera *Carobius* and *Notiobiella*, and probably they will be found in several localities in Polynesia.

The CHRYSOPIDAE are represented by the very common and almost cosmopolitan genus *Chrysopa*, and by the interesting genus *Austrochrysa*, which is peculiar to the Samoan and Hawaiian Islands. At present eight species of the genus *Chrysopa* are known to occur in the Samoan Islands, and six of these are also known to exist in other localities. *Chrysopa skottsbergi* is undoubtedly the most interesting of these six species, as it was only known previously as inhabiting Easter Island. Two species are new. *Austrochrysa* is closely related to *Anomalochrysa*, which has been found only in the Hawaiian Islands.

The Neuropterous fauna of Samoa, considered as a whole, gives an impression of close relationship to the Malayan-Australian fauna. But the two genera *Anomalochrysa* and *Eucarobius*, and probably also *Buxtonia*, seem to be representatives of a peculiar endemic fauna of the Hawaiian-Polynesian Islands.

The appended list of the Samoan Neuroptera at present known shows the occurrence of the species on the adjacent islands.

	Samoa.	Society Is.	Tonga.	Fiji.	Other countries or islands.
<i>Formicaleo subpunctulatus</i> . . .	X			X	
<i>Archaeomicromus navigatorum</i> . . .	X			X	Australia, New Hebrides.*
<i>Buxtonia fulva</i>	X				
<i>Eucarobius fasciatus</i>	X				
,, <i>graeffei</i>	X				
,, <i>oblongus</i>	X				
<i>Austrochrysa samoana</i>	X				
<i>Chrysopa ramburi</i>	X	X	X		Australia, Tasmania.
,, <i>innotata</i>	X			X	Australia.
,, <i>remota</i>	X				Riu-Kiu Is. (Japan); New Hebrides.
,, <i>oceania</i>		X			Hawaii Is.; New Hebrides; Tahiti.
,, <i>atalotis</i>	X				Australia.
,, <i>otalatis</i>	X				Australia, New Caledonia.
,, <i>skottsbergi</i>	X				Easter Is. (South America): Ellice Is.; New Hebrides.
,, <i>hopkinsi</i>	X				
,, <i>armstrongi</i>	X				
,, <i>buxtoni</i>		X	X		

* Vila, Efate Is.; Tanna (Buxton, 1925).

MYRMELEONIDAE.

The Polynesian-Hawaiian fauna includes only a few representatives of this family. The only known species are *Eidoleon bistrigatus* Ramb. (*M. striola* Walk., *M. torvus* Walk., and *M. perjurus* Walk.), of Hawaii, Fiji, Society Is., and Australia; *Formicaleo wilsoni* MacLachl., of Hawaii (*F. ballievi* Navas, of Honolulu, is undoubtedly the same species); *Dictyoleon nervosus* Esb.-P. (*Weeleus triseriatus* Bks.), of Fiji; and the species mentioned below.

1. *Formicaleo subpunctulatus* Brauer (Plate II, fig. 5).

Verhandl. k. k. zool.-bot. Ges., Wien, Bd. xix, p. 16, 1869. Viti Inseln (Fiji Is.), Oneata (Lakemba Is.).

Face and palpi yellowish-white, apical segment of palpi brownish tinged; a blackish-brown, shining band across face and enclosing insertions of antennae. Above this a testaceous band. Vertex pale brown, with two rows of elevated brown markings. Antennae long, dark brown with yellowish annulations; the club conspicuous. Prothorax about as long as broad, greyish-brown, with a narrow yellow longitudinal median streak, and with a broader, irregular, yellowish streak on each side towards lateral margins; each of these streaks enclosing a small dark spot, situated in a transverse furrow one-third of distance from front margin; front angles rounded. Meso- and metathorax greyish-brown, with some paler markings. Abdomen blackish above, yellowish below; third abdominal segment above with a basal yellowish furcate marking, and an oblong median and two lateral triangular spots of same colour near apical margin; fourth segment with similar markings; fifth, sixth and seventh segments each with a large triangular yellowish spot at base, and a small yellowish spot on each side at apical margin. Legs yellowish; fore femora greyish-brown, with exception of basal part and a black ring at apex; femora of second and third legs with a dark ring at apex; tibiae with a dark band in middle and at apex. Legs with whitish hairs and black bristles. Fifth tarsal joint as long as first four joints combined. Spurs somewhat curved, and also as long as first four joints combined. Wings long and slender, pointed at apex. Venation yellowish-white, all longitudinal veins except *C* with blackish streaks. A number of cross-veins totally black. Anterior Banksian line in fore wing faintly indicated, posterior line distinct; no Banksian lines in hind wing. Stigma yellowish, in fore wing with a brown spot at its inner end.

Fore wing 31 mm. ; hind wing 31 mm.

Upolu : Apia, 14.ix.1923, 1 ♀ (Swezey and Wilder).

F. subpunctulatus somewhat resembles the two Australian species *F. vafer* Walker (*List*, Part II, p. 345, 1853) and *F. somnolentus* Gerstaecker (*Mitt. naturw. Ver. Neu-Vorp. u. Rügen*, Jahrg. xvi, p. 13, 1885), but in these latter the posterior Banksian line in the fore wing is hardly indicated or totally absent ; their wings are also somewhat falcate at the tips.

HEMEROBIIDAE.

The Polynesian members of this family seem to be rather peculiar, and their relationship to the Australian fauna is perhaps closer than to the Hawaiian. The last named seems to possess a number of interesting genera, *Nesothauma* Perk., *Pseudopsectra* Perk. and *Nesomicromus* Perk., unknown from other parts of Oceania ; the Polynesian fauna includes such genera as *Notiobiella* Bks. (Fiji Is.), and *Archaeomicromus*, both of which likewise occur in Australia ; also *Buxtonia* and *Eucarobius*, which appear to be endemic.

KEY TO THE GENERA OF HEMEROBIIDAE.

- | | |
|---|--------------------------|
| 1. A recurrent cross-vein at base of costal area in fore wing. Two <i>Rs</i> in fore wing | 2. |
| — No recurrent cross-vein at base of costal area of fore wing. Three or more <i>Rs</i> in fore wing | <i>Archaeomicromus</i> . |
| 2. Costal area of fore wing rather suddenly narrowed at inner end of stigma. One cross-vein (near base) between <i>Sc</i> and <i>R</i> of fore wing | <i>Buxtonia</i> . |
| — Costal area of fore wing gradually narrowed towards apex. Four cross-veins between <i>Sc</i> and <i>R</i> of fore wing | <i>Eucarobius</i> . |

Archaeomicromus (Krüger, nom. nud.).

Stettiner Ent. Zeitung, Bd. lxxxiii, p. 171, 1922.

This genus, the name of which was published without any description, was erected to include *Micromus timidus* Hagen (East Africa), *M. morosus* Gerst. (Java), *M. pusillus* Gerst. (various Malayan localities), *M. vinaceus* Gerst. (Australia) and several other species. The genus may be briefly characterised as follows :

In the fore wing five or more *Rs* ; *M* forks further out than origin of first *Rs*. *M*₁ and *M*₂ are each forked in a regular manner. *Cu* forks very close to the base of the wing. *Cu*₁ running close to *M*₂, but the two veins do not coalesce. *Cu*₁ emits two branches ; *Cu*₂ simple ; *1A* forked near the margin ; *2A* forked

near base; $3A$ simple. In hind wing M forks as in fore wing; only Cu_1 is present; $1A$ forks near base; $2A$ and $3A$ simple. All the longitudinal veins with marginal forks on branches.

Genotype: *Micromus timidus*, Hag.

2. *Archaeomicromus navigatorum* Brauer (Plate II, fig. 3).

Micromus navigatorum Brauer, Verhandl. zool.-bot. Ges. Wien, Bd. xvii, p. 508, 1867. Fiji, Ovalau, and Samoa (Upolu).

Micromus vinaceus Gerstaecker, Mitt. naturw. Ver. Neu-Vorp. u. Rügen, Jahrg. xvi, p. 111, 1885. Australia (Rockhampton).

Pale yellowish-brown. Antennae yellowish-brown. Thorax pale brown; prothorax with a pale longitudinal median streak, and on each side with indications of two dark spots or grooves. Abdomen dark brown. Legs pale. Venation of fore wings pale with brown streaks; all the cross-veins dark brown. The apical and hind portion of the fore wings faintly brownish shaded. Stigma hardly visible. As a rule 7 Rs . A small brown spot just below the fork of M . Venation of hind wings pale, with exception of the outer series of gradate veinlets and, for a short distance, the adjoining main-veins.

Length of fore wing 7–8 mm.; that of hind wing 6–7 mm.

Upolu: Malololelei, 2,000 ft., 25.iv.1924, two specimens; 20.vi.1924, one specimen; 25.vi.1924, four specimens; 28.vi.1924, one specimen; vii.1924, one specimen; xii.1924, one specimen; vii.1925, one specimen (Wilder). Vailima, 25.x.1924, two specimens. Apia, 4.v.1925, one specimen; 28.v.1925, one specimen.

Tutuila: Pago Pago, 0–300 ft., iv.1918, 1 ♂ (Kellers); 9.ix.1923, two specimens; 24.ix.1923, one specimen (Swezey and Wilder). Amauli, 5.ix.1923, one specimen (Swezey and Wilder).

Savaii: Salailua, 21.v.1924, one specimen (Bryan). Safune (lowlands to 1,000 ft.) 1.v.1924, one specimen (Bryan).

Manua: Tau, 27.ix.1923, one specimen (Swezey and Wilder).

This species seems to be common, and to have a wide range in the islands. So far as I know, it has not been rediscovered on the Australian continent.

Buxtonia, gen. n.

Costal area of fore wing very broad, but rather suddenly narrowed in the pterostigmal area; a short recurrent veinlet present at base of costal area.

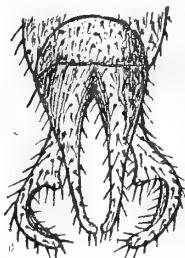
Costal area narrow in the hind wing, but strongly broadened in the pterostigmal area. Numerous unforked and thickened but closely placed cross-veins in the stigmal area of both pairs of wings. The subcostal area very narrow, but broadened behind the stigmal area; at the outer end of this area *Sc* and *R* unite. In the fore wing two *Rs*; the first arises near the base of the wing, and forks opposite the origin of the second. *M* forks farther out than the origin of first *Rs*. *Cu* forks near the base of the wing. *1A*, *2A* and *3A* present. In the hind wing two *Rs*. *M* dichotomously forked. *Cu₂* absent; *1A* present. Only the inner row of gradate veinlets is present in the fore wing; in the hind wing this row is indicated by a single cross-vein, situate in the middle part of the wing. The jugal lobe and bristles well developed; the humeral lobe ending in a rather long appendage, provided with two long and strong bristles at its tip.

Genotype : *Buxtonia fulva*, sp. n.

This peculiar and interesting genus, named in honour of Mr. P. A. Buxton, one of the collectors of the type-specimen, stands near *Notiobiella* Banks, from which, however, it is readily distinguishable by the shape of the pterostigmal areas, and the thickened cross-veins enclosed in these areas.

3. *Buxtonia fulva*, sp. n. (Plate II, fig. 4; Text-fig. 1).

Head yellowish; genae tinged with reddish; palpi yellowish, apical segment dark. Antennae yellowish, dark brown towards tips, strongly haired.



TEXT-FIG. 1.—*Buxtonia fulva*, gen. et sp. n.; anal appendages of ♂, seen from above.

Prothorax almost as long as broad, yellowish, with reddish lateral margins. Meso- and metathorax and abdomen yellowish. Legs pale, almost colourless; intermediate and hind tibiae spindle-shaped. Anal appendages of male very conspicuous, yellowish. Wings hyaline, with a greenish tinge. Venation greenish-yellow. Pterostigmal area in fore wing pale brown; its thickened cross-veins very conspicuous; pterostigmal area of hind wing strongly yellowish. Series of gradate cross-veins (inner row) in fore wing brown and brownish shaded. Inner cross-vein between *M* and *Cu* brown; remaining cross-veins greenish-yellow. Apical third of fore wings with some small pale brown markings, mostly enclosed by the forks.

Fore wing 5 mm.; hind wing 3.3 mm.

Upolu: Vailima, 25.x.1924, 1 ♂ (type); 2.ii.1925, 1 ♂.

Notiobiella stigmatica Banks (*Proc. Ent. Soc. Wash.*, vol. xi, p. 80, 1909), of Central Queensland, seems to be allied to the species described above, and should probably be transferred to *Buxtonia*. *N. stigmatica* is without the oblique transverse band on the fore wings, and its venation is faintly brown.

Eucarobius, gen. n.

Antennae much shorter than fore wing. Wings, especially front pair, rather broad and with rounded tips. Recurrent vein present at base of costal area in fore wing; costal area broad, its cross-veins strongly forked; subcostal area rather broad and with four cross-veins. Two radial sectors; both *M* forked; *Cu₁* with several branches; *Cu₂* simple. *1A* simple, *2A* forked, *3A* simple. No row of gradate veinlets, but a number of irregularly placed cross-veins; apical fourth, however, without cross-veins. In hind wing costal area narrow, and costal cross-veins simple. Subcostal area with a cross-vein near apex. Three branches from *Rs*. *M* forking in about middle of wing. Only *Cu₁* is present, emitting a number of branches to hind margin near its tip. *1A* forked near tip; *2A* simple. One cross-vein in hind wing. Jugal process very prominent.

Genotype : *Eucarobius fasciatus*, sp. n.

This new genus, which must be placed between *Notiobiella* Banks and *Carobius* Banks, is easily recognisable by the presence of four cross-veins in the subcostal area of the fore wings, and by the irregularly situated cross-veins in the disc of the same wings.

KEY TO THE SPECIES OF EUCAROBIUS.

1. Fore wings long and rather slender, thrice as long as broad. Antennae bicolorous *oblongus*, sp. n.
- Fore wings rather broad, not two and a half times as long as broad.
 - Antennae unicolorous 2.
 2. Antennae jet black *graeffei* Br.
 - Antennae yellowish-brown *fasciatus*, sp. n.

4. *Eucarobius fasciatus*, sp. n. (Plate II, fig. 2).

Head pale brown, with two small dark spots between insertions of antennae. Palpi yellowish-brown; apical segment darker. Antennae yellowish-brown, hairy; basal segment very stout. Prothorax pale brown, much broader than

long; meso- and metathorax pale brown. Abdomen brownish-yellow. Legs pale, intermediate and hind tibiae with pale brown median band. Wings hyaline; tinged with brown. Venation pale brown; all cross-veins shaded with brownish. Fore wings with several irregularly placed brownish transverse streaks, especially in apical portion. Pterostigmal area pale brown, in fore wing with a small, darker spot at each end.

Fore wing 4·5-5·5 mm.; hind wing 3·5-4 mm.

Tutuila: (no exact locality named), 1,000 ft., 13.x.1918, 1 ♂ (type), 1 ♀; 1,100-1,200 ft., 18.iv.1918, one specimen (Kellers); eastern end of Tutuila, 1,070 ft., 21.vi.1918, two specimens; 1,200 ft., 21.vii.1918, one specimen (Kellers). Pago Pago, 24.ix.1923, one specimen; 29.ix.1923, one specimen; 30.ix.1923, one specimen (Swezey and Wilder); 1 ♀, 14.xii.1925.

The species has been collected only in Tutuila.

5. *Eucarobius graeffei* Brauer.

Hemerobius graeffei Brauer, Verhandl. k. k. zool.-bot. Ges. Wien, Bd. xvii, p. 507, Taf. xiv, fig. 1, 1867. Samoa (Upolu).

Head yellowish; labrum and a transverse streak on clypeus shining black; a large black spot on each gena; two small, closely adjacent brown spots on face, partly below and partly between insertions of antennae. Vertex brown, with three longitudinal yellowish streaks. Palpi yellowish; apical segment black. Antennae jet black, hairy; basal segment stout. Prothorax several times broader than long, blackish-brown, with three yellowish longitudinal streaks; meso- and metathorax blackish-brown, with pale spots. Legs pale; fore tibia with a brown band at base and in middle; intermediate and hind tibiae with a brown median band. Wings of same shape as in foregoing species, but their membrane hardly tinged with brown. Venation pale brown, cross-veins brownish shaded. Brown, transversely placed markings mostly arranged as in *E. fasciatus*, but with a tendency to form a series of arched streaks along posterior and apical margins of fore wings. Some indistinct pale brown markings in apical area of hind wing.

Fore wing 5 mm.; hind wing 3·5 mm.

Savaii: Salailua, 22.v.1924, one specimen (Bryan).

The insect, which is in bad condition, has been compared with the type in the Hamburg Museum. Brauer's figure, though fairly good, shows the wings too pointed at the tips. In a note pointing out that *Hemerobius graeffei* ought

to be placed in a new genus, Brauer mentions the four cross-veins in the subcostal area of the fore wing as a good generic character.

6. *Eucarobius oblongus*, sp. n. (Plate II, fig. 1).

Head dark brown; labrum, a transverse band along posterior margin of clypeus and a transverse band between insertions of antennae black. Palpi brown, apical segment darker. First and second segments of antennae brown, third to tenth segments quite pale, almost whitish, remainder of antennal segments black. Prothorax much broader than long, blackish-brown with some indistinct pale spots; meso- and metathorax and abdomen blackish-brown. Head, antennae, thorax and abdomen very hairy. Legs pale, tibiae with traces of an indistinct brown median band; intermediate and hind tibiae spindle-shaped. Wings rather long, rounded at tips, and with front and hind margins almost parallel; membrane hyaline, with scarcely noticeable brownish tinge; venation pale brownish; costal cross-veins yellowish; remaining cross-veins brown and narrowly shaded with brownish. Fore wings with several brownish markings; a trace of brownish markings in apical part of the hind wing.

Fore wing 5 mm.; hind wing 4 mm.

Upolu: Vailutai, 12.xii.1925, 1 ♂ (type). Vailima, 26.x.1924, 1 ♀. Malololelei, 2,000 ft., 10.iii.1924, 1 ♀; 30.xi.1924, one specimen. Apia, 29.iii.1924, one specimen; 15.ix.1923, one specimen (Swezey and Wilder). Tuaefu (Sliding Rock), 16.ix.1923, one specimen (Swezey and Wilder).

Savaii: Salailua, 23.v.1924, one specimen (Bryan).

Var. *brunneus*, var. n.

Fore wings, except costal area, middle part of subcostal area and pterostigmal area, strongly tinged with brownish; wing-markings absent.

Upolu: Malololelei, 8.i.1925, one specimen (Wilder).

Savaii: Safune, rain forest, 2,000–4,000 ft., 2.v.1924, one specimen (Bryan).

Although these examples are not in good condition, I do not doubt that they represent a variety of *E. oblongus*.

CHrysopidae.

Besides *Chrysopa*, which is known to be represented in almost all parts of the world, the Samoan fauna only includes the genus *Austrochrysa*, which seems to be indigenous to the islands, and perhaps also to Hawaii.

KEY TO THE GENERA OF CHRYSOPIDAE

1. Two rows of gradate veinlets in the wings. Basal cell of the median fork in the fore wing triangular *Chrysopa*.
 — At least three rows of gradate veinlets in the wings. Basal cell of the median fork quadrangular *Austrochrysa*.

Austrochrysa, gen. n.

Wings similar in shape to those of *Anomalochrysa*. Costal area of fore wing rather broad. Three or more irregular series of gradate cross-veins. *Sc* and *R* running independently to the apical margin; at its tip *R* gives off three or more small branches to the margin. The basal cell in the median fork of the fore wing quadrangular, as in the genus *Nothochrysa* MacLachlan.

Genotype: *Austrochrysa samoana*, sp. n.

In general appearance this genus much resembles *Anomalochrysa* MacLachlan, from which, however, it is easily distinguishable by the rectangular basal cell in the median fork of the fore wing. From the closely allied Tasmanian genus *Nothancyla* Navas (*Broteria*, p. 51, 1910) it differs in having three or more series of gradate cross-veins. *Anomalochrysa princeps* Perkins (*Fauna Hawaiiensis, Neuroptera*, vol. ii, p. 47, pl. III, fig. 1, 1899), of Hawaii, should probably be assigned to the new genus.

7. *Austrochrysa samoana*, sp. n. (Plate II, fig. 6).

Pale yellowish. Labrum tinged with reddish. Antennae pale, longer than fore wings; basal segment of antennae very stout; the two basal segments very close together. Prothorax a little longer than broad, and with rounded anterior angles; a brown spot on each side near posterior angle. Two small brown spots on front margin of mesothorax (Abdomen wanting in case of type.) Claws with a broad indentation internally. Wings hyaline. Longitudinal veins pale with exception of *Rs*, which is brown at its origin, *M₂*, apical part of *Cu₂*, of *1A* and of *2A* brown. Cross-veins of both pairs of wings brown at one end, or at both ends, or totally black; some few also narrowly edged with brownish. Margins of wings and all veins with long hairs.

Fore wing 18 mm.; hind wing 16 mm.

Upolu: Vailima, 26.iii.1925, one specimen.

Chrysopa.

KEY TO THE SPECIES OF THE GENUS.

1. First cross-vein from *Rs* in fore wing touching *Psm* outside basal cell of median fork *otalatis* Bks.
- First cross-vein from *Rs* touching *Psm* within basal cell of median fork 2.
 2. Stigma of fore wing with brownish spot at its inner end *hopkinsi*, sp. n.
 — Stigma without such spot 3.
 3. Prothorax longer than broad 4.
 — Prothorax not so long as broad 5.
 4. Head orange. Antennae strongly tinged with yellowish at base, becoming greyish-brown towards apex *oceanica* Walk.
- Head reddish. First to third segments of antennae yellowish-red; remainder of basal half of antennae dark brown; apical half yellowish *atalotis* Bks.
 6. Inner row of gradate veinlets not parallel to outer series 6.
 — Both series of gradate cross-veins parallel to each other and to apical margin of wing 7.
 7. Head and prothorax with dark markings
 — Head and prothorax without dark markings 8.
 8. Stigma (especially in hind wings) large and conspicuous, yellowish to reddish-brown. Basal segment of antennae with distinct dark brown, rectangular spot above *armstrongi*, sp. n.
 — Stigma somewhat inconspicuous, not strongly coloured. Basal segment of antennae without spot 9.
 9. Most cross-veins in fore wing totally or partly dark *buxtoni*, nom. n.
 — Venation pale, yellowish-green *ramburi* Schn.
skottsbergi Esb.-P.
innotata Walk.
remota Walk.

8. Chrysopa ramburi Schneider (Plate III, fig. 1).

Schneider, Symbolae, p. 107, tab. 34, 1851. Australia; *Walker, List, Neur. Ins. in Coll. Brit. Mus.*, Part II, p. 254, 1853. Tasmania; *Esben-Petersen, Arkiv. für Zoologi*, Bd. xi, p. 29, 1918. Australia.

Chrysopa vicina Kempny, *Verhandl. zool.-bot. Ges., Wien*, Bd. liv, p. 354, 1904. Australia.

Chrysopa neutra Navas, *Broteria*, vol. ix, p. 47, 1910. Australia.

Chrysopa reaumuri Navas, *Revista Real Acad.*, Madrid, Tom. xii, p. 646, fig. 1, 1914. Australia.

Chrysopa notosticta Navas, *Ann. Soc. scient. Brux*, Tom. 38, p. 104, fig. 31, 1914. Sydney.

Chrysopa controversa Lacroix, *Bull. Soc. Ent. Fr.*, Année 1920, p. 104, 1920. Tonga.

Face and palpi yellowish; below each antenna a short reddish-brown streak; on vertex two reddish-brown streaks, convergent in front, each of them interrupted in the middle. Antennae brown to black, longer than fore wings;

basal segment stout, yellowish, with a narrow brown longitudinal streak dorsally, and a small dark brown spot at its upper end exteriorly; second antennal segment yellowish, dark brown exteriorly. Prothorax yellowish green, a little broader than long, and with rounded front angles; one-third from base a black transverse line, interrupted in the middle; a short, black, obliquely placed streak or line on each side, near posterior angle, and a dark spot on lateral margins, near anterior angles. Two very small brown dots on front margin of scutellum of meso- and of metathorax; an oblique, indistinct brown streak almost above base of each wing. Abdomen greenish-yellow; most segments with a fine, short, transverse, dark or black dorso-lateral streak on line close to front margin. Legs pale greenish, tips of tarsal segments a little darker; claws without indentation at base. Wings hyaline; longitudinal veins greenish, with exception of basal part of *Rs*, of median fork, of *Cu₂*, of *1A* and of *2A* in fore wing; the three last named veins mostly dark; basal part of *Sc* in fore wing with a fine black line along its front edge (this black line hardly visible or wanting in specimens not fully mature). Near base of *R* in fore wing an oblong dark spot. Posterior margin of fore and hind wings dark for a short distance close to base. Costal cross-veins in both pairs of wings and radial cross-veins in fore wings mostly dark, but their anterior ends always pale or whitish. Several cross-veins in basal third of fore wings dark. The two rows of gradate cross-veins close together, forming two straight lines parallel to each other and to apical margin of wing. Four to six cross-veins in inner series in fore wing, six to ten in outer series. Five cross-veins between *Rs* and *Psm* in fore wing.

Fore wing 13–15 mm.; hind wing 11–13 mm.

Upolu : Mulifanua, 9.vi.1924, one specimen.

Tutuila : Pago Pago, 20.ix.1923, one specimen (Swezey and Wilder).

The above description has been drawn up from a fully matured specimen, but the species is very liable to vary, especially as regards the markings of the vertex, of the two basal antennal segments, of the thorax and of the abdomen; in several specimens these markings are wanting or indicated only by spots. In other specimens the usually dark cross-veins and *Cu₂*, *1A* and *2A* of the fore wings are sometimes almost pale, but this is mostly due to immaturity. It is highly probable that *Chrysopa jaluitana* Kempny (Marshall I.), *C. deutera* Navas (Keeling I.), and *C. tahitensis* Navas (Tahiti) are also identical with *C. ramburi*. The species is fairly common in Australia, and specimens from Tahiti (*Galatea* Expedition, 1845–47) are preserved in the Copenhagen Museum.

9. Chrysopa innotata Walk. (Plate III, fig. 5).

Walker, List, *Neur. Ins. in Coll. Brit. Mus.*, Part II, p. 254, 1853. Australia.

Head yellowish, genae sometimes with a reddish tinge; palpi yellowish-brown. Antennae longer than fore wings, yellowish at base, becoming darker towards apex. Prothorax broader than long, with rounded anterior angles, and with a transverse ridge about the middle. Pro meso- and metathorax, and abdomen, greenish, with a yellowish dorsal streak. Legs pale; claws strongly curved, pointed at tips, and with a broad indentation at base interiorly. Longitudinal veins yellowish-green, except origin of *Rs*, origins of most branches from *Rs*, and the apical part of *1A* and *2A* in fore wings, which are dark. Cross-veins in fore wings entirely dark, or dark at their ends. Venation of hind wings yellowish-green, except costal cross-veins and majority of gradate veinlets. First cross-vein from *Rs* in fore wing touching *Psm* within basal cell of median fork. Four cross-veins between *Rs* and *Psm*. The series of gradate cross-veins regularly placed, and parallel to each other. Distance between the two rows shorter than that between inner row and *Rs*, and equal to distance between outer row and apical margin of wing. Number of gradate cross-veins about $6/7$ in fore wing (six in inner row, seven in outer row), about $4/6$ in hind wing. Stigma opaque, yellowish-green and not prominent.

Fore wing 12–14 mm.; hind wing 10–12 mm.

Upolu: Malololelei, 2,000 ft., vii.1924, one specimen.

Tonga Is.: Nukualofa, 15.ii.1925, two specimens.

[It will be observed that this and other species are recorded from Samoa and Australia. The possibility at once suggests itself that some material has been wrongly labelled. This, however, is clearly not the case, since some of the species were collected in Samoa by ourselves and labelled in England, others by various American collectors, and labelled in Honolulu. Nor should it be supposed that Walker's original specimens were wrongly labelled, for *C. atalotis* has the same distribution and was described by Banks. The apparent anomaly is probably due to lack of knowledge.—P. A. BUXTON.]

10. Chrysopa remota Walk. (Plate III, fig. 10).

Walker, List, *Neur. Ins. in Coll. Brit. Mus.*, Part II, p. 238, 1853. Samoa Is., Loochoo Is. (Riu-kiu Is.).

The original description of this species is as follows: "Testaceous, stout; antennae very little longer than the wings; prothorax broader than long, a

little narrower in front ; abdomen slightly ferruginous, testaceous at tip ; wings limpid, rather short, of moderate breadth ; veins pale green, bristly ; first series of gradate veinlets incomplete towards the tip ; cubital areolet much less than half the size of the adjoining subcubital areolet ; stigma pale testaceous."

Expanse of wings about 38 mm.

This species has not been rediscovered up till now. To the description given by Walker the following may be added : The two rows of gradate veinlets regularly placed, parallel to each other and to the apical margin of the wings. Five cross-veins from *Rs* to *Psm*. In respect of the form of wings and the venation this species is very similar to *C. oceanica* Walker, of Hawaii, in which, however, the prothorax is longer than broad, and the wings are a little more slender.

A single specimen from New Hebrides, Tanna, ix.1925, is included in the collection, and agrees well with *C. remota*, except that it possesses an indication of two brownish spots on each side of the transverse prothorax, one spot being on the anterior, the other on the posterior angle.

11. *Chrysopa oceanica* Walk. (Plate III, fig. 7).

Walker, *List, Neur. Ins. in Coll. Brit. Mus.*, Part II, p. 238, 1853. Hawaii.

Chrysopa V-rubrum Brauer, *Reise Novara, Neuropteren*, p. 39, 1866. Tahiti.

Head and palpi orange ; a reddish V-shaped marking sometimes indicated on front margin of vertex. Antennae much longer than fore wings, strongly yellowish at base and becoming greyish-brown towards apex. Prothorax longer than broad, with decidedly rounded front angles ; greenish, with yellowish longitudinal median streak ; lateral margins with a reddish-brown streak near anterior angles. Meso- and metathorax and abdomen yellowish-green. Legs pale green ; claws angulate and with a very broad indentation at base interiorly. Venation of wings greenish. Stigma greenish, opaque, not very prominent. The two rows of gradate veinlets regularly placed, almost parallel to each other and to apical margin of wing. First cross-vein from *Rs* in fore wing touching *Psm* within basal cell of median fork. Five or six cross-veins between *Rs* and *Psm* in fore wing.

Fore wing 15–18 mm. ; hind wing 14–16 mm.

Society Islands : Borabora, five specimens (*Galatea* Expedition, 1845–47) in Copenhagen Museum.

New Hebrides : Hog Harbour, Santo Island, 6.viii.1925, one specimen (Buxton).

It is interesting to note that, among the material in the Copenhagen Museum, two specimens have the reddish V-shaped marking, mentioned by Brauer, just indicated on the front margin of the vertex.

12. *Chrysopa atalotis* Bks. (Plate III, fig. 3).

Banks, *Psyche*, vol. xvii, p. 102, 1910. Australia.

Head reddish. Basal segment of antennae stout, yellowish-red; second and third segments yellowish; remainder of basal half of antennae dark brown, narrowly annulated with yellowish; apical half of antennae yellowish. Prothorax much longer than broad, narrowed in front, with anterior angles rounded; green, with an orange longitudinal median band. Meso- and metathorax with an orange median band, yellowish-green along lateral margins. Abdomen yellowish-green. Legs pale; claws angulate, and with a broad indentation at base interiorly. Venation greenish-yellow. The two series of gradate veinlets regularly placed, parallel to each other and to apical margin of wing. In fore wing five cross-veins between *Rs* and *Psm*. Stigma greenish-yellow, opaque, not prominent.

Fore wing 16 mm.

Tutuila : Pago Pago, 30.ix.1923, one specimen (Swezey and Wilder).

This species agrees with *C. oceanica* as regards the form and the venation of the wings, and the two species can only be separated by the different colouring of the head and antennae.

13. *Chrysopa otalatis* Bks. (Plate III, fig. 6).

Banks, *Psyche*, vol. xvii, p. 102, 1910. Queensland.

Chrysopa lemoulti Lacroix, *Bull. Soc. Ent. Fr.*, Année 1923, p. 119, 1923. New Caledonia.

Head and palpi yellowish-green. Antennae as long as fore wing, yellowish, becoming a little darker towards apex. Prothorax almost as long as broad; anterior angles truncate; yellowish-green, with yellowish longitudinal median streak; one-third from base a transverse, rather prominent ridge. Meso- and metathorax, abdomen and legs yellowish-green; claws angulate, rather long and slender, sharply pointed at tips, and with a small indentation at base interiorly. Venation pale. Stigma opaque, yellowish, not very prominent. First cross-vein from *Rs* in fore wing touching *Psm* outside basal cell in median fork. Five cross-veins between *Rs* and *Psm* in fore wings. Two regular rows of gradate

cross-veins, parallel to apical margin of wing ; distance between the rows greater than that between outer series and apical margin, or between inner series and *Rs*. Number of gradate cross-veins in fore wing about 7/8, in hind wing 6/7. Venation and margins of wings with long yellowish-green hairs.

Fore wing 11–13 mm. ; hind wing 10–11 mm.

Savaii : Safune, lower forest, 1,000–2,000 ft., 5.v.1924, five specimens (Bryan) ; 12.v.1924, one specimen (Bryan).

This species is not uncommon in Australia, and examples from New Caledonia have also been seen.

14. *Chrysopa skottsbergi* Esb.-Pet. (Plate III, fig. 4).

Esben-Petersen, *The Natural History of Juan Fernandez and Easter Island*, vol. iii, p. 310, fig. 2, 1924. Easter Island.

Yellowish-green. Head, palpi, thorax, abdomen and legs yellowish. Antennae a little longer than fore wing, yellowish at base, becoming dark brown to black towards apex ; basal segment rather robust, with a distinct, dark brown, rectangular dorsal spot near tip. On each side of clypeus an indistinct brownish spot. Prothorax broader than long, anterior angles truncate. Abdomen with rather long, pale pilosity. Claws with a strong indentation at base. Wings rather short and broad, obtuse at tips. Venation pale ; gradate veinlets and a few cross-veins at base of forewings somewhat darker. Stigma (especially in hind wings) large, conspicuous, brownish-yellow, opaque. At origin of *Cu* in fore wing a small brownish spot. Four or five cross-veins between *Rs* and *Psm* ; first cross-vein from *Rs* in fore wing touching *Psm* within basal cell of median fork. The two series of gradate veinlets regularly placed, parallel to each other and to apical margin of wing ; space between the two rows very wide, much wider than distance between outer row and apical margin.

Fore wing 10–12 mm. ; hind wing 9–11 mm.

Upolu : Malololelei, 2,000 ft., vi.1924, one specimen ; 6.vi.1924, one specimen (Armstrong). Apia, 14.ix.1923, three specimens (Swezey and Wilder) ; ii.1924, one specimen. Tuaefu, 16.ix.1923, one specimen (Swezey and Wilder).

Tutuila : Pago Pago, 24.ix.1923, three specimens (Swezey and Wilder).

Savaii : Fagamalo, xi.1925, four specimens.

Besides this material, the collection includes an example from Ellice Is., Funafuti, ix.1924.

This species is closely allied to *Chrysopa basalis* Walker (*List*, Part II, p. 239, 1853.—Loochoo Is. (Riu-Kiu Is.)), *C. otalatis* Banks (*Psyche*, vol. xvii, p. 101, 1910.—Australia), *C. formosana* Esben-Petersen (*Ent. Mitt.*, Bd. II, p. 257, fig. 7, 1913.—Formosa), and *C. rutila* Esben-Petersen (*Ann. and Mag. Nat. Hist.*, Ser. 9, vol. xix, p. 453, pl. XI, fig. 9, 1927.—Chagos Is.). In the species mentioned, however, there is no distinct rectangular dark brown spot on the basal segment of the antenna.

15. *Chrysopa hopkinsi*, sp. n. (Plate III, fig. 9).

Head orange; apical segment of maxillary palpi yellowish-brown. Antennae yellowish, longer than fore wing. Prothorax much broader than long, green, with a longitudinal dark brown streak on each side near lateral margin; meso- and metathorax and abdomen yellowish-green; legs pale green. Claws with a broad indentation at base interiorly. Longitudinal veins yellowish-green; *Rs* in fore wing dark brown at its origin; branches from *Rs* mostly brownish; apical part of *1A* and *2A* dark brown; all cross-veins brown, some of them also faintly shaded with brownish; posterior branches of marginal forks in apical part of fore wings decidedly dark brown and very prominent; apical forks of *Sc*, *R* and *Rs* blackish-brown, thickened and very prominent; basal costal cross-vein blackish-brown, thickened towards *Sc*; basal subcostal cross-vein blackish. Stigma greenish, with a brownish spot at its inner end, and with a number of distinct cross-veins; subcostal area behind stigma with four to six cross-veins; first cross-vein from *Rs* in fore wing touching *Psm* within basal cell of median fork. Venation of hind wings greenish, with exception of a few cross-veins in their basal part. The two series of gradate veinlets very irregularly placed; inner row starting from third cross-vein between *Rs* and *Psm*, and in fore wing its apical part (four veinlets) forming a straight, transverse line; outer row rather regularly placed, running parallel to apical margin.

Fore wing 14 mm.; hind wing 12 mm.

Upolu: Malololelei, 2,000 ft., 1.v.1924, one specimen (type.—Abdomen shrivelled).

This peculiar species, named in honour of one of its discoverers, is somewhat different from most of its congeners owing to the shape of the marginal forks in the apical part of the fore wing; the direction of the inner row of gradate veinlets in the fore wing is also very remarkable.

16. Chrysopa armstrongi, sp. n. (Plate III, fig. 2).

Head orange; as a rule two small reddish dots on front margin of vertex. Palpi yellowish. Antennae as long as fore wing, greyish-yellow at base and becoming a little darker toward apex; basal segment stout, yellowish. Prothorax yellowish, much broader than long; two indistinct reddish spots on front margin, two on each lateral margin, and two more distinct brownish-red spots on hind margin; a transverse groove near hind margin. Meso- and metathorax yellowish; greenish towards lateral margins. Abdomen strongly yellowish, almost orange. Legs pale; claws angulate, with very broad indentation at base interiorly. Venation of wings yellowish-green; in fully matured specimens, basal costal cross-veins and outer series of gradate veinlets in fore wings a little darker. Stigma long, opaque, in fully matured specimens brownish-yellow, and rather prominent. First cross-vein from *Rs* in fore wing touching *Psm* within basal cell of median fork (almost in middle of front margin of cell). Four to five cross-veins between *Rs* and *Psm* in fore wing. Outer row of gradate veinlets regularly placed, parallel to apical margin of wing; inner row forming an undulating line, starting from fifth or sixth cross-vein between *Rs* and *Psm*.

Fore wing 16–18 mm.; hind wing 14–16 mm.

Upolu: Malololelei, 20.vi.1924, one specimen (Type); vi.1924, two specimens (Armstrong); 12.iii.1924, one specimen; 5.vii.1924, two specimens. Apia, 28.iv.1925, one specimen.

This large species, named in honour of the collector of the type-specimen, is easily recognisable by the peculiar direction of the inner series of gradate cross-veins.

16A. Chrysopa buxtoni, nom. n. (Plate III, fig. 8).

Chrysopa oceanica Navas (nec Walker), *Revista Real Acad. Madr.*, Tom. xii, p. 477, 1914.
Fiji Is.

Head and palpi yellowish; front margin of vertex with a reddish spot. Antennae as long as fore wing, black; basal segment yellowish, with a brownish-red spot above; second segment yellowish, without markings. Prothorax yellowish, about as long as broad; anterior angles truncate; a deep transverse groove about middle; two impressions near front margin; one impression on each side, near hind angle. Meso- and metathorax with a strongly yellowish, median dorsal streak. Abdomen yellowish-green. Legs pale; claws almost

angulate, with a broad indentation at base interiorly. Venation of wings greenish ; inner cross-vein in cubital fork of fore wing a little darker. The two rows of gradate cross-veins regularly placed, with exception of the two posterior veinlets in inner series ; interval between the two rows rather narrow. Between *Rs* in fore wing and *Psm* four or five cross-veins, the first touching *Psm* within basal cell of median fork. Stigma pale greenish, not very prominent.

Fore wing 13·8–15 mm. ; hind wing 12–13 mm.

Tonga Is. : Neiafu, Vavau, 7.iii.1925, one specimen (Hopkins).

This species is undoubtedly *Chrysopa oceanica* Navas, the name of which is preoccupied by *C. oceanica* Walker, *List, Neur. Ins. in Coll. Brit. Mus.*, Part II, p. 238, 1853.

Chrysopa buxtoni is especially characterised by its dark antennae, and by the position of the posterior veinlet in the inner gradate series ; this veinlet is situate proportionally much more basal than the others. The species will probably sooner or later be found also to inhabit the Samoan Is.

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- ,, 2. *Eucarobius fasciatus*, sp. n. Pago Pago.
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PLATE II.

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LIST OF ILLUSTRATIONS.

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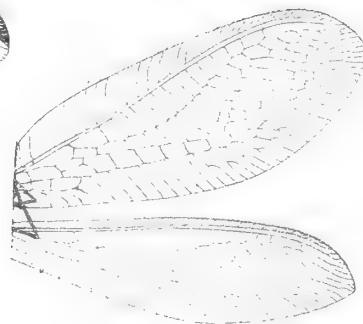
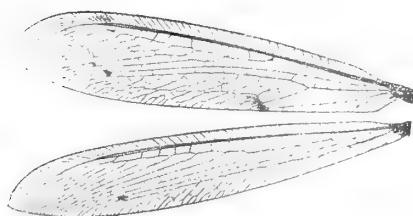
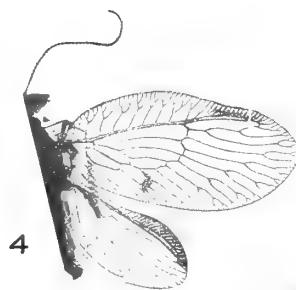
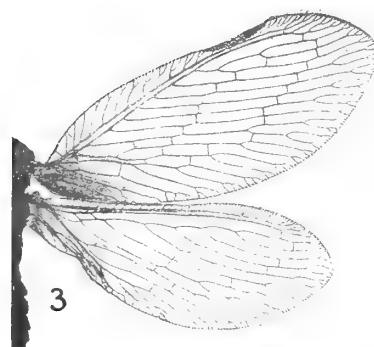
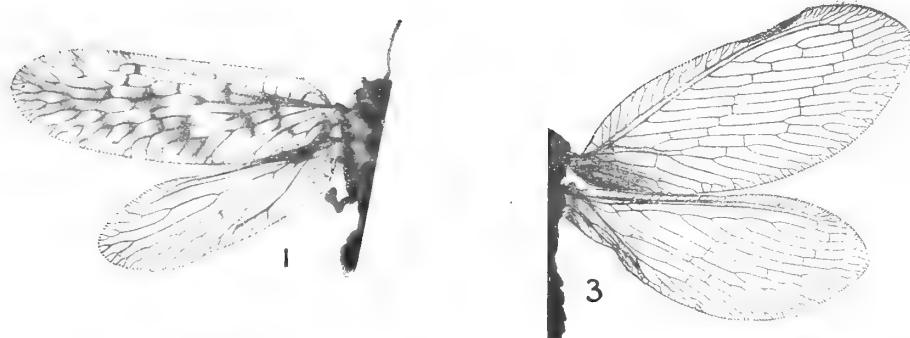
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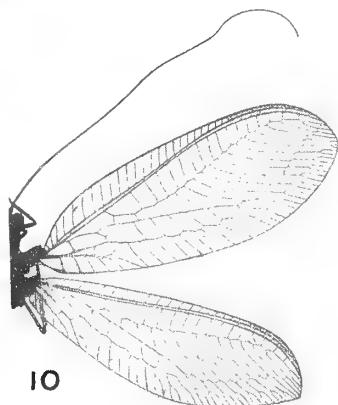
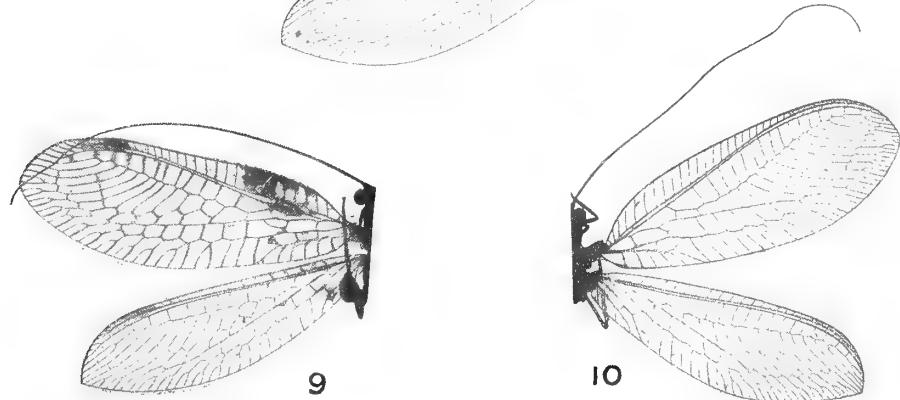
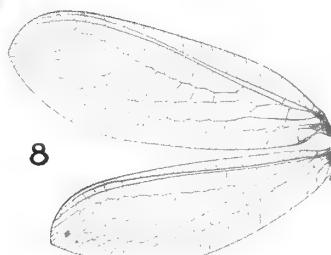
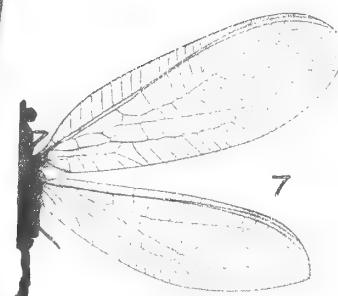
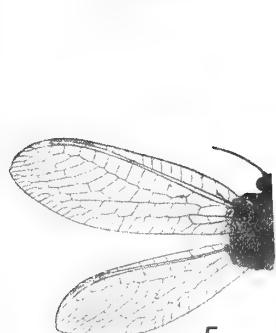
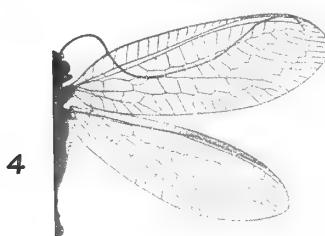
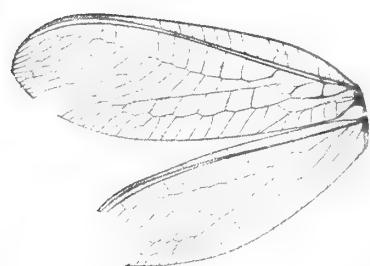
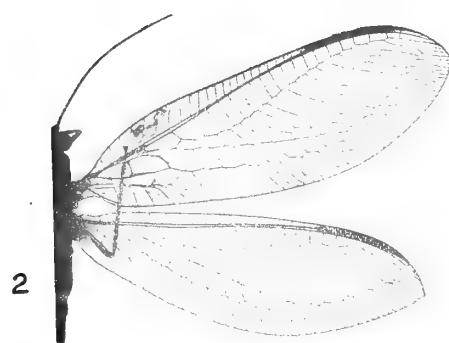
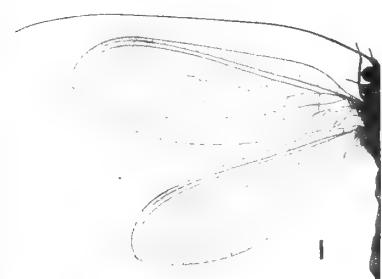
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A P T E R Y G O T A.

BY GEORGE H. CARPENTER, D.Sc., Keeper of the Manchester
Museum, University of Manchester.

(With 32 Text-figures.)

THE collection of Apterygota made on the Samoan Islands by Mr. P. A. Buxton includes examples of only eight species, of which four are Thysanura (bristle-tails) and four Collembola (spring-tails). There are no startling novelties among these insects. Four or five of them belong to widespread species already recorded from parts of the Eastern tropics, while three (two Thysanura and one Collembolan) appear to represent undescribed forms of known genera.

THYSANURA.

LEPISMATIDAE.

1. *Acrotelsa collaris* (Fab.).

Two examples of this bristle-tail, which is widely distributed through the tropics and lives generally as a "messmate" in human dwellings were taken at Apia, Upolu, in January, 1924.

2. *Gastrotheus*, sp.

A single female specimen, taken at Apia in April, 1924, represents this genus in the collection. As it cannot be certainly referred to any known species and no satisfactory study could be made of it without dissection, it seems best to await the acquisition of further examples before attempting a description. Since the genus *Gastrotheus* is spread over tropical regions, including Central America, Africa, South-Eastern Asia and Australia, its presence in the Samoan archipelago is not surprising. The species found in Apia is nearly related to the Sumatran *G. palpisetra* Silvestri (1916), which is a guest of *Termes gilvus* Hagen.

Trinemura Silvestri (1908).

This genus belongs, like *Gastrotheus*, to the Nicoletiinae, a subfamily of the Lepismatidae distinguished by the absence of eyes, the development of complex sense-organs on the palps, the presence of "combs" on the maxillary laciniae and prominent genital processes. Most of the described species of *Trinemura* resemble the typical *Nicoletia* in their narrow, subparallel body-form and the absence of scales; the members of the present genus differ in possessing a full series of paired abdominal stylets, which occur on each segment from the second or third to the ninth inclusive, while in *Nicoletia* and *Trinemophora* only the two hinder pairs of these stylets are represented. *Trinemurodes* (Silvestri, 1916) may readily be distinguished from *Trinemura* and other allied genera by the absence of an empodial appendage on the foot. Species of *Trinemura* are already known to occur in Australia and New Caledonia (Silvestri, 1908, 1915, 1920). The discovery in the New Hebrides and the Samoan group of the form now described considerably extends the known range of the genus eastward across the Pacific.

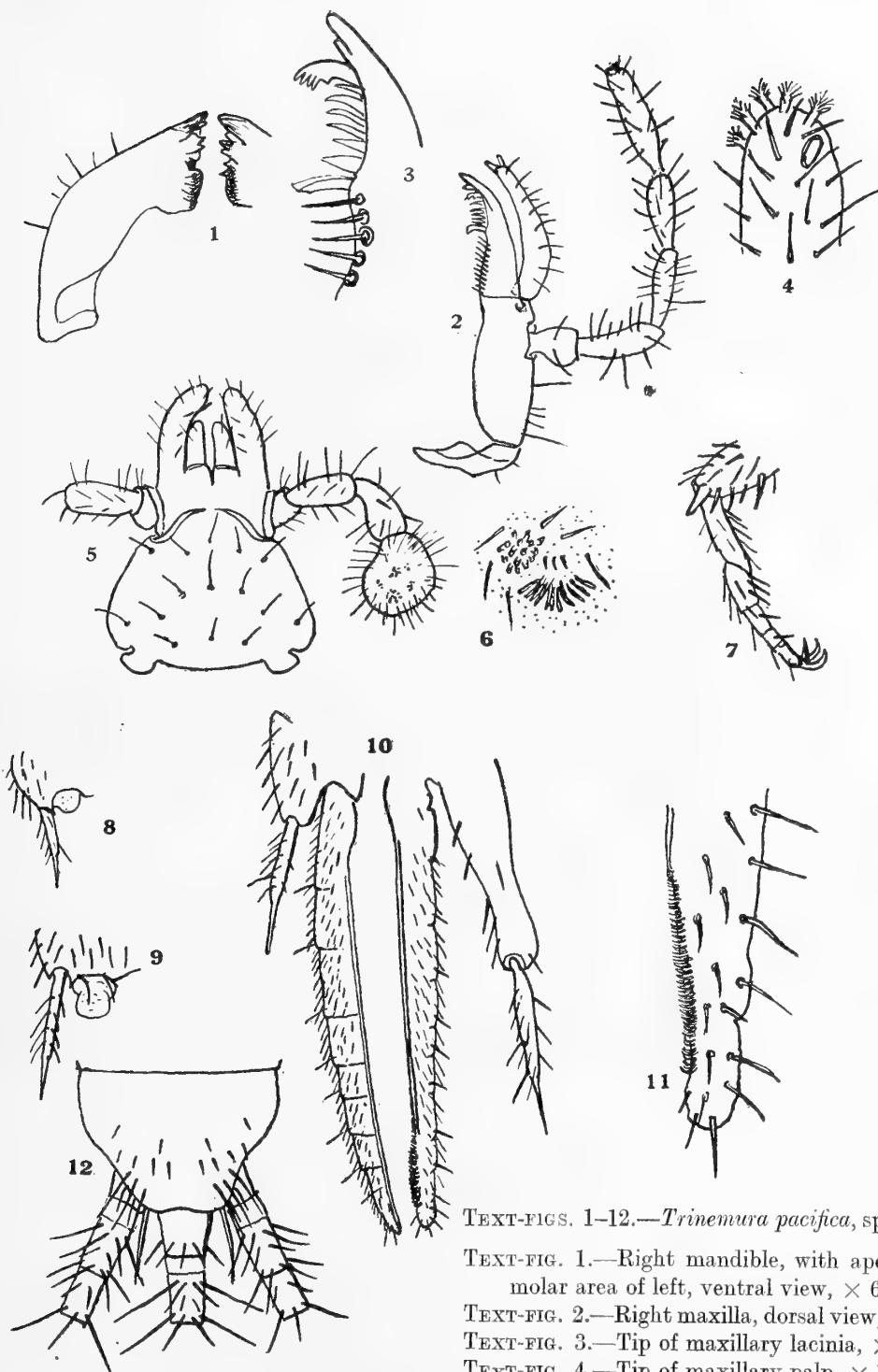
3. *Trinemura pacifica*, sp. n. (Text-figs. 1 to 12).

Length 6 mm. Form narrowly elongate, parallel-sided (breadth 1 mm.). Eight pairs of abdominal stylets (on sterna 2nd to 9th inclusive), and six pairs of exsertile vesicles (on sterna 2nd to 7th inclusive). Feelers, cercopods and terminal filament, each half body-length. Terminal segment of labial palp nearly as broad as long. Female gonapophyses elongate, rather stout and tapering. Tenth abdominal tergum slightly concave behind.

Samoa : Malololelei, 2,000 ft., 20.vi.1927, 3 ♀♀; 23.xi.1924, one ♀. New Hebrides : Efate I., 10.vii.1925, three ♀♀.

This species is distinguished from all its known congeners by the presence of stylets, as well as exsertile vesicles, on the second abdominal segment. In the two Australian species, *T. novae-hollandiae* Silvestri (1908) and *T. excelsa* Silvestri (1920), these appendages begin on the third abdominal segment, but in *T. novae-caledoniae* Silvestri (1915), the second segment, though without stylets, bears vesicles. This is the species to which *T. pacifica* seems most nearly related, since the two agree in the sinuate hind margin of the tenth abdominal tergum, and hardly differ in the proportions of the maxillary and labial palps.

The mandibles (fig. 1) are of the form usual in this group of genera, with a constant distinction between the right and left jaw. The maxillae (fig. 2) are



TEXT-FIGS. 1-12.—*Trinemura pacifica*, sp. n. ♀.

TEXT-FIG. 1.—Right mandible, with apex and molar area of left, ventral view, $\times 60$.

TEXT-FIG. 2.—Right maxilla, dorsal view, $\times 60$.

TEXT-FIG. 3.—Tip of maxillary lacinia, $\times 180$.

TEXT-FIG. 4.—Tip of maxillary palp, $\times 180$.

TEXT-FIG. 5.—Labium, $\times 60$.

TEXT-FIG. 6.—Sensory organs on terminal segment of labial palp, $\times 240$.

TEXT-FIG. 7.—Tip of hind tibia and tarsal segments, $\times 60$.

TEXT-FIGS. 8 and 9.—2nd and 4th right abdominal stylets and vesicles, $\times 60$.

TEXT-FIG. 10.—8th right subcoxa, stylet and gonapophysis (to left) and 9th left sub-coxa, stylet and gonapophysis (to right) ventral view, $\times 60$.

TEXT-FIG. 11.—Tip of left gonapophysis, $\times 180$.

TEXT-FIG. 12.—Tenth abdominal tergum with bases of cerci and terminal filament, $\times 60$.

also typical, with a comb and seven blade-like processes on the inner border of the lacinia (fig. 3), and a group of feathery sensory organs and an ovate area at the tip of the palp (fig. 4). The labium (fig. 5) has the terminal segment of the palp greatly broadened and provided with groups of delicate sensory hairs (fig. 6). The legs are somewhat stout ; the foot (fig. 7) is indistinctly segmented, with a straight pointed empodial appendage between its two strong curved claws. The stylets (fig. 8) of the second abdominal segment are shorter than those of the succeeding segments (fig. 9), those of the eighth and ninth segments being the most prominent (fig. 10). The anterior processes of the ovipositor (fig. 10) show imperfect jointing ; the posterior gonapophyses (figs. 10, 11) are more slender, with a strongly ridged spinose area on the inner face towards the tip.

4. *Trinemura gracilis*, sp. n. (Text-figs. 13–25).

Length 6 mm. Form narrowly elongate, parallel-sided (breadth 1 mm.). Eight pairs of abdominal stylets (segments 2–9), and six pairs of exsertile vesicles (segments 2–7). Feelers two-thirds of body-length. Terminal segment of labial palp two-thirds as broad as long. Tenth abdominal tergum with obtuse hinder edge and small auricular lateral lobes.

Samoa : Malololelei, 2,000 ft., 25.iv.1924, one ♀.

This species resembles *T. pacifica* in most of its characters, but differs in the terminal segment of the labial palp (fig. 17) being narrower, in the details of the lacinial comb-process (fig. 16), the more slender feet (fig. 22), the hind margin of the tenth abdominal tergum being obtuse (fig. 25), not indented (see fig. 12), and in the smaller and less-developed spinose area of the hinder gonapophyses (figs. 23, 24).

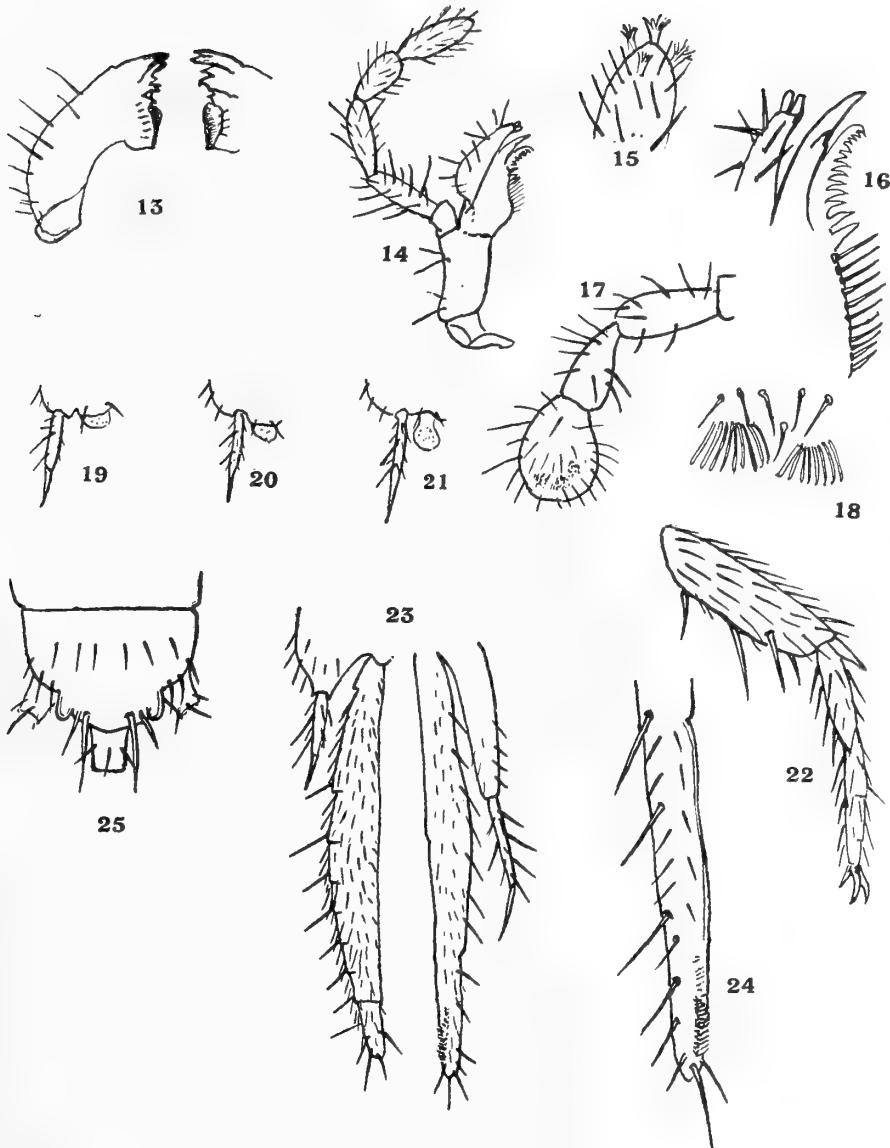
COLLEMBOLA.

PODURIDAE.

5. *Xenylla octo-oculata*, sp. n. (Text-figs. 26 to 32).

Length 0·8 mm. Four ocelli on each side of head (fig. 26). Foot with two tenent hairs, claw untoothed (fig. 27). Anal spines short, recurved (figs. 30, 31). Spring short but well developed ; mucro distinct from dens, with upcurved tip and narrow lamella (fig. 32). Colour (in alcohol) : dark purple-speckled above, pale yellow beneath.

Samoa : Upolu, Apia, 1925, numerous.



TEXT-FIGS. 13-25.—*Trinemura gracilis*, sp. n. ♀.

TEXT-FIG. 13.—Right mandible, with apex and molar area of left, ventral view, $\times 60$.

TEXT-FIG. 14.—Left maxilla, dorsal view, $\times 60$.

TEXT-FIG. 15.—Tip of maxillary palp, $\times 200$.

TEXT-FIG. 16.—Tips of maxillary galea and lacinia, $\times 200$.

TEXT-FIG. 17.—Left labial palp, $\times 75$.

TEXT-FIG. 18.—Sensory organs on terminal segment of labial palp, $\times 240$.

TEXT-FIGS. 19, 20, 21.—2nd, 4th and 6th right abdominal stylets and vesicles, $\times 60$.

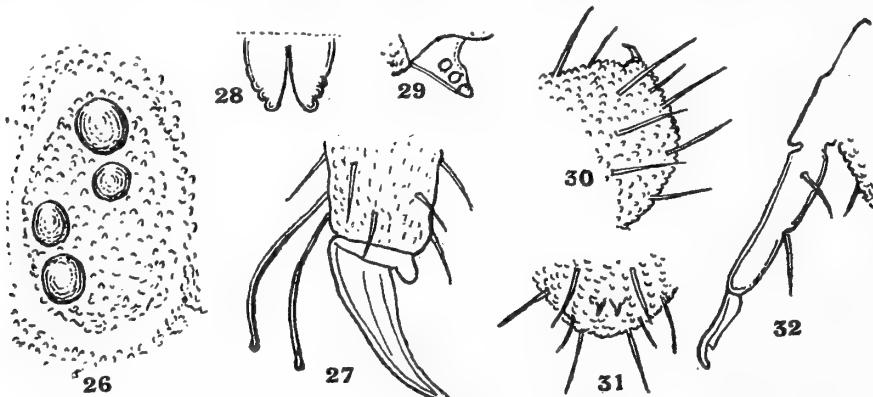
TEXT-FIG. 22.—Tibia and foot of hind leg, $\times 60$.

TEXT-FIG. 23.—8th right subcoxa, stylet and gonapophysis (to left) and 9th left sub-coxa, stylet and gonapophysis (to right), ventral view, $\times 60$.

TEXT-FIG. 24.—Terminal part of 9th gonapophysis, $\times 180$.

TEXT-FIG. 25.—Tenth abdominal tergum with bases of cerci and terminal filament, $\times 60$.

This species may be distinguished from others of the genus by having four ocelli on each side of the head (instead of the usual five), and by the curved tip of the mucro, which recalls the condition in *Achorutes (Hypogastrura)* rather than in the European and North American species of *Xenylla*, which have the mucro straight and frequently fused with the dens. The catch (figs. 28, 29) in this species is well developed; each limb has three blunt rounded teeth.



TEXT-FIGS. 26-32.—*Xenylla octo-oculata*, sp. n.

TEXT-FIG. 26.—Left group of ocelli.

TEXT-FIG. 27.—Tip of foot with claw and tenent hairs.

TEXT-FIGS. 28, 29.—Front and side views of catch.

TEXT-FIGS. 30, 31.—Side and dorsal views of abdominal extremity with anal spines.

TEXT-FIG. 32.—Lateral view of spring. All $\times 600$.

6. *Onychiurus fimetarius* (Linn.).

A number of specimens of *Onychiurus* taken at Apia, Upolu, on the water in taro axils, 25.v.1925, do not seem separable from the common *O. fimetarius* (Linn.), syn. *O. inermis* Tullberg, which is widely spread over Europe and North America, and, as mentioned by Folsom (1917), has already been recorded as occurring in the eastern tropics (Africa and Sumatra). In Europe *O. fimetarius* is commonly met with in soil, and is often found in greenhouses beneath flower-pots; it is also a typical inhabitant of British and Irish caves.

ENTOMOBRYIDAE.

7. *Lepidocyrtus medius* Schäffer (1898).

A single specimen taken at Aleipata, Upolu, iv.1924, seems clearly referable to this species, which, described by Schäffer from an example from the Bismarck

Archipelago (Ralum), has since been recorded by Handschin (1926) as occurring at Buitenzorg, Java. The species has thus a wide range in Malaya and the Pacific Islands.

8. *Cremastocephalus celebensis* Schäffer (1898).

This species, described by Schäffer from material from Celebes, since recorded by Folsom (1924) as occurring in Sumatra, and by Handschin (1925) as found in the Sunda Islands, seems to be a characteristic spring-tail of the Samoan highlands. Several specimens were taken at Malololelei, Upolu, 25.vi. and 23.xi.1924. As usual in these species with very long feelers, the length of the antennal segments is variable, but the foot as well as the mucro and scale-process of the spring affords good distinctive characters.

From the distribution of this and other species already described and recorded in this paper, it is evident that even such small and frail insects are capable of undergoing wide dispersal. Further study of the subject in connection with other insular faunas may give indication of the means by which this has been brought about.

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- Text-fig. 26. Left group of ocelli.
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